EARTHQUAKE
e-Newsletter about what's movin' and shakin' at the Earth Science Museum

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August 2024
Volume 13, Issue 8

ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

Outreach

With schools just starting after being closed for the summer, there are no ESM outreach activities to report this month.

New Additions to the ESM Volcanic Rocks & Minerals Display

By Harvey Jong

We're always searching for ways to improve the ESM Volcanic Rocks & Minerals Display and add noteworthy specimens as they become available. Since volcanic activity in Iceland continues to be in the news, efforts have focused on acquiring samples representing recent and past eruptions.

Svartsengi Area

In the February 2024 newsletter, we reviewed the volcanic activity on Iceland's Reykjanes Peninsula which included eruptions in the Svartsengi (Icelandic for "black meadow") area. The article concluded with a note about magma accumulation and the potential for another eruption by the end of February. The increased magma flow actually resulted in three eruption episodes: one that occurred on March 16th-May 8th; a second on May 29th-June 22nd; and a third which began on August 23rd.

March 16th-May 8th Eruption

Lava from the March 16th Eruption Moves Towards the Town of Grindavik
Almannavarnir/Björn Oddsson photo, ©Icelandic Met Office, used with permission, via Wikimedia Commons

This eruption started in the evening on March 16th after a small earthquake swarm. Lava fountains reaching several dozen meters (a few hundred feet) in height were reported along a 3 km (1.9 mi) fissure. Lava flowed in two different directions triggering evacuations of the Blue Lagoon tourist attraction and the town of Grindavik. The flow rate was initially measured at (1,100-1,200 m^3/s (39,000-42,000 ft^3/s), but quickly subsided. The total volume of lava was estimated to be around 34 million m^3 (1.2 billion ft^3).

Panoramic Overview of Eruption on March 20, 2024

This image was taken over the fissure and shows the proximity of the lava flows towards the Svartsengi power plant, Blue Lagoon, and Grindavik.

May 29th-June 22nd Eruption

May 29th Eruption
Almannavarnir rikislögreglustjora/Björn Oddsson photo, - PD, via Wikimedea Commons
This photo shows the line of lava fountains at the start of the May 29th eruption.

A fifth eruption episode occurred along the Sundhnúksgigar Crater Row. Lava initially flowed from a 1 km (0.62 mi) long fissure which later expanded to 3.4 km (2.1 mi). The average extrusion rate was estimated to be around 1,500 m^3/s (53,000 ft^3/s). A large amount of ash was produced by the contact of the lava with accumulated groundwater. A total volume of 45 million m^3 (1.6 billion ft^3) covered an area of 9.3 km^2 (3.6 mi^2) which represents the largest eruption in the Svartsengi series.

[Panoramic Overview of the Eruption on June 2, 2024]

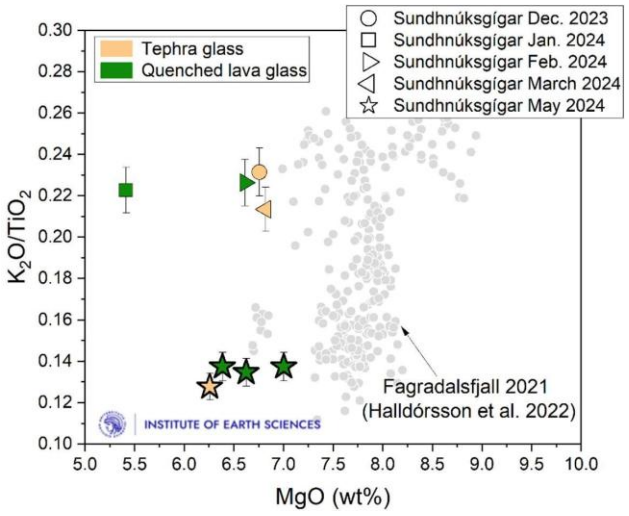
August 23rd-? Eruption

At 9:26 pm, an intense earthquake swarm started in the Sundhnúkur crater row and led to the opening of an eruptive fissure. Unlike earlier eruptions, most of the lava flow has been moving north and has caused wildfires in the area.

One Hour After the Start of the August 23rd Eruption
Bjōrn Oddsson/Civil Protection photo, via Icelandic Meteorological Office, en.vedur.is
The fissure is estimated to 4 km (2.49 mi.) long.

Analysis of Lava Samples

The ongoing volcanic activity in the Svartsengi area offers a unique opportunity to study the magma sources and volcanic processes involved with these eruptions. Monitoring how the composition of lava samples vary over time and location reveals insights into the magma's origin and interactions. A comparative analysis of the Svartsengi samples with those collected during the 2021 Fagradalsfjall eruption indicate the lavas may have been derived from a similar magma source (Troll et al., 2024). Geochemical data involving the ratio of K_2O/TiO_2 and weight percentage of MgO show a rough correspondence.



Comparison of Volcanic Glass Samples from the Sundhnúksgígar and Fagradalsfjall Eruptions
Fig. 2 from Eruption at Sundhnúksgígar, May 2024 – preliminary petrographic and geochemical data, Institute of Earth Sciences, University of Iceland
https://earthice.hi.is/eruption-sundhnuksgigar-may-2024-preliminary-petrographic-and-geochemical-data

Combining this observation with seismic evidence suggests that magma may have been transferred from the Fagradalsfjall Volcanic System to the Svartsengi Volcanic System (Troll et al., 2024).

Svartsengi Basalt Specimen

Like most of the recent samples from the Svartsengi area, the new basalt specimen of the ESM display includes a number of small plagioclase crystals. Unfortunately, the sample is still being delivered from Iceland at the time of this article. The following video, however, provides some idea of the basic appearance of this piece.

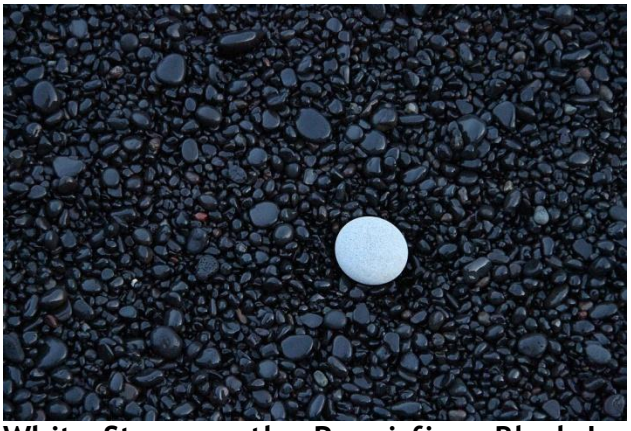
Svartsengi Lava Samples from January and February
This short video from Val Troll's Volcano Channel on youTube presents two samples collected from the Svartsengi area. They are similar to the new lava specimen, except the ESM piece is less glossy.

Reynisfjara Area

Reynisfjara is located on the central south coast of Iceland near the seaside village of Vik. The area is known for its dramatic black sand beach, basalt columns, and sea stack formations. The otherworldly landscape has been used as a backdrop for films, such as Star Trek, Star Wars, and Game of Thrones.

Reynisfjara translates to "Reynir's beach", and Reynir may refer to either a wealthy Norwegian Viking who settled in the area or a name given by Björn from Valdresi in Norway who colonized the region.

The distinctive black sand is a result of volcanic activity of the nearby Katla (Icelandic for "kettle") volcano and coastal erosion. Basaltic lava flows from Katla occurred late in the last Ice Age and eroded over time producing sediments ranging from coarse sand to smooth, rounded stones.



White Stone on the Reynisfjara Black Lava Stones
Qaswed photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Reynisfjara's Black Sand Beach, Mount Reynisfjall, and Sea Stack Formations
Hansueli Krapf photo, - CC_BY_SA-3.0, via Wikimedia Commons
This photo shows the famous black sand beach at the base of Mount Reynisfjall. Mount Reynisfjall was formed by a subglacial volcanic eruption that occurred at the end of

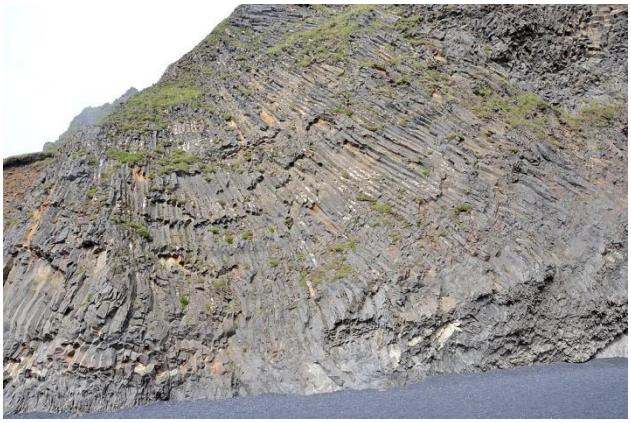
the last Ice Age. It is 340 m (1,115.5 ft) high and is comprised of irregular layers of tuff, pillow lava, and columnar basalt.

Reynisdrangar Sea Stack Formations
sergefr photo, - CC_BY_SA-2.0, via Wikimedia Commons
Reynisdrangar is the name for a group of sea stack formations located offshore. The 66 m (2,016 ft) high pillars were formed by wind and water erosion of the adjacent basalt cliffs.

Reynisfjara's Basalt Columns
Olga Emst photo, - CC_BY_SA-4.0 International, via Wikimedia Commons
The hexagonal basalt columns along the cliffs of Mount Reynisfjall represent one of the most striking features of Reynisfjara.

Array of Basalt Columns
orangemania photo, - CC_BY_SA-2.0, via Wikimedia Commons
The formation of the basalt columns involves a process known as columnar jointing. When lava cools, the basalt contracts and develops cracks to release heat energy. Initially, the cracks form at the surface and combine into polygonal shapes varying from three to eight sides, with six sides being the most common. The cracks later extend downwards in a roughly planar and parallel fashion. An array of regular, straight columns is called a colonnade.

Close-up of Basalt Columns
Sally Wilson photo, - CC_BY_SA-2.0, via Wikimedia Commons



Irregular Basalt Columns
Olga Emst photo, - CC_BY_SA-4.0 International, via Wikimedia Commons
These irregular columns may have been caused by rapid cooling from water covering the molten lava and are called entablature.

Reynisfjara's Hálsanefshellir Cave
Gerd Eichmann photo, - CC_BY_SA-4.0 International, via Wikimedia Commons
Hálsanefshellir Cave is one the sea caves at Reynisfjara and is accessible during low tide. It was formed by a combination of wave action and erosion over time.

Entrance to Hálsanefshellir Cave
Gerd Eichmann photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Close-up View Inside Hálsanefshellir Cave
Gerd Eichmann photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Reynisfjara Basalt Specimen

The new specimen represents the Fe-Ti rich basalts that have been reported for the Reynisfjara area.

Top View of Reynisfjara Basalt Specimen
Reynisfjara, Southern Region, Iceland
9.5 x 10 x 6.5 cm

Close-up of Reynisfjara Basalt Specimen
Reynisfjara, Southern Region, Iceland
Field of view: 2 cm
Tiny colorless to white analcime crystals (less than 1 mm) are present in some of the vesicles of the specimen.

References

Troll, V.R., F.M. Deegan, T. Thordarson, A. Tryggvason, L. Krmiček, W.M. Moreland, B. Lund, I.N. Bindeman, A. Hōskuldsson, and J.M.D. Day (2024) The Fagradalsfjall and Sundnúkur fires of 2021-2024: a single magma reservoir under the Reykjanes Peninsula, Iceland? *Terra Nova*. 00, 1-10.

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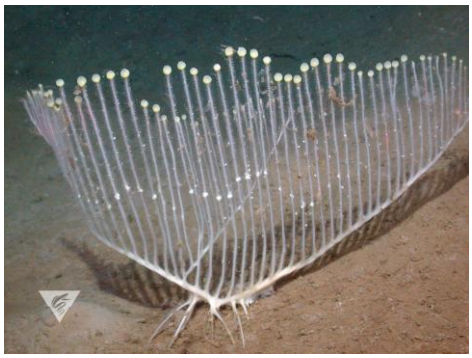
From a fish with a transparent head to an adorable octopus with webbed arms, MBARI researchers have encountered some captivating creatures in more than three decades of deep-sea research. Meet some of our favorite denizens of the deep and learn about their adaptations to survive in an environment of frigid cold, inky darkness, and crushing pressure.

Barreleye fish



Don't let the harp sponge's whimsical appearance and innocent sounding name fool you, it's actually a deep-sea predator.

MBARI
Monterey Bay Aquarium Research Institute

Animals of the Deep
https://www.mbari.org/education/animals-of-the-deep/

Arizona Rocks 135

Text by Ray Grant

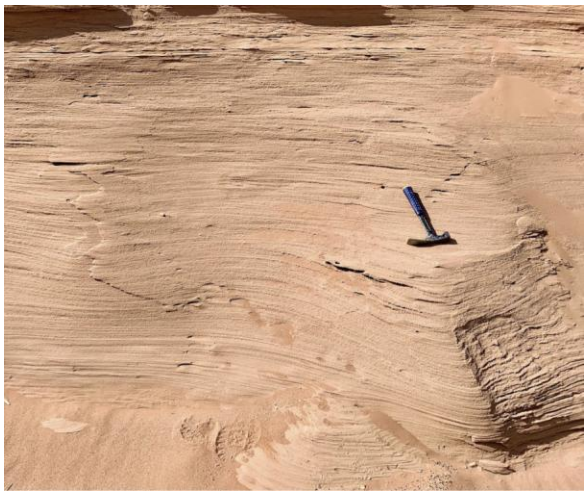
Arizona is the Grand Canyon State and millions of people come here to visit it every year. One common question is: how old is the canyon? Geologists have been arguing about the age for years. Geologists at the Arizona Geological Survey have a new study that found it formed around 5 to 6 million years ago. Other geologists support this young age from different lines of evidence. But some think it must be older, these geologists have older ages for at least different parts of the canyon, some as old as 70 million years. This new study can be found on the Arizona Geological Survey website:
Douglass, J. and Gootee, B.F., 2024. Discovery of beach sand, beachrock, and capping tufa on Balakai Mesa: Implications for the Bidahochi Formation and the overflow origin of the Grand Canyon: University of Arizona, Arizona Geological Survey, Open-File Report 24-02, 9 p.

Doing field work on the Balakai Mesa area, they found lake deposits and beaches for a large lake several 100 miles long (Lake Bidahochi). It is estimated this lake was present 8 to 5 million years ago. As the lake got larger it overflowed the Kaibab Plateau, around 6 million years ago, this released water cut the Grand Canyon into the plateau.

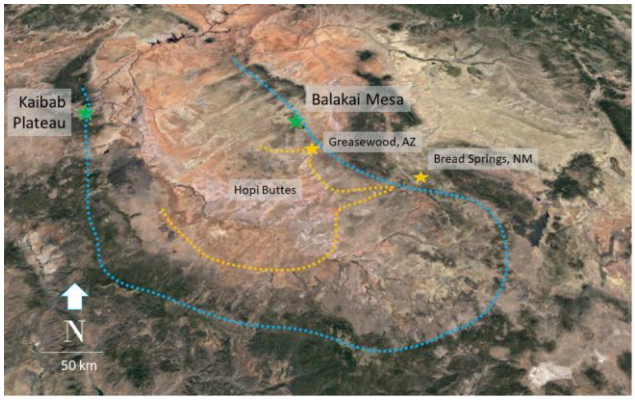
Arguments about the Canyon's age will continue, but the Canyon is Grand and Arizona's number one place to visit.

Grand Canyon, Ray Grant photograph

Mudflat and sandflat deposits from Lake Bidahochi preserved at the Train Track Location (from Open-File Report 24-02)



Close-up view of laminated sandflat deposits (from Open-File Report 24-02)



Dashed blue line estimates the highest extent of paleolake Bidahochi (from Open-File Report 24-02)

AZ Mining, Mineral & Natural Resources Education Museum Update August 2024

https://ammnre.arizona.edu/

Catie Carter Sandoval
cscarter@email.arizona.edu
703.577.6449

Help support the museum at:
http://tinyurl.com/SupportMM-NREMuseum

Over the past few months, our Executive Director Marta Bones has been working with a group of museum consultants to finish planning before we begin construction on our building at 1502 W. Washington St. As part of that process, we recently hosted members of our Governor-Appointed Advisory Council along with University of Arizona administration and representatives from downtown Phoenix museums to get their direct feedback about the mission and vision the new AMMNRE Museum. We are especially grateful that Rep. Gail Griffin, who has been our champion since the closing of the Mining and Mineral Museum, was able to attend and share her ideas. Once we finish this process, we will be able to focus on construction with our design-build team who has already completed many initial estimates for the building.

In exhibits news, we also look forward to the upcoming Denver Gem and Mineral Show running September 12-15, where we will be following the show theme and showcasing some 'Mineral Oddities' from our museum collection. Our friends at the University of Arizona's Alfie Norville Gem and Mineral Museum will also be displaying some impressive specimens at the nearby Hardrock Summit.

Thank you for your continued support! We'll keep you updated about our progress as we move forward with the new museum.

Museum staff (Catie and Marta) and planning consultants in front of our building on Washington Street

Charrette participants at our first meeting at the University of Arizona's Phoenix Bioscience Core

Consultant presentation on the second day of our charrettes

Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

Pinal Geology and Mineral Society next meeting

September 18, 2024

Meetings are the third Wednesday at 7pm, doors open at 6:00

Everyone is welcome!

www.pinalgeologymuseum.org

Ray Grant ray@pinalgeologymuseum.org

Pinal Geology and Mineral Museum

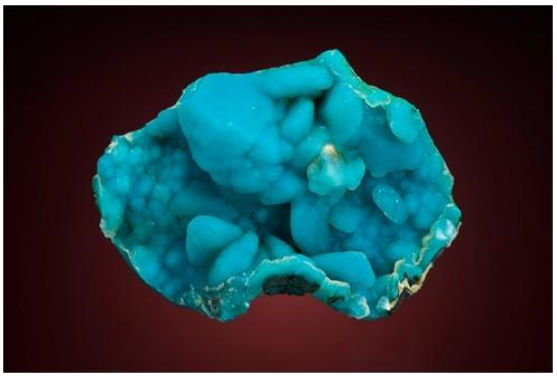
September – May hours are Wednesday – Saturday from 10-4, admission is free.

Groups can arrange special visits please call 520-723-3009.

John Weide, retired chemistry professor at Mesa Community College will give a program about the mineral quartz. John has been a mineral collector for many years and has specialized in collecting quartz.

Quartz (SiO_2) is the most common mineral found in the earth's crust with the exception of the feldspar group. The forms and varieties of quartz are many. There are all the coarse-grained varieties: citrine, smoky, rose, blue, and amethyst. And there are the fine-grained varieties: chalcedony, sard, carnelian, agate (many many types), chrysoprase, prase, heliotrope, bloodstone, flint, chert, and jasper. Quartz is found in igneous, sedimentary, and metamorphic rocks. It is hard and resistant to weathering so as rocks weather the quartz is left as pebbles or sand.

Did you know quartz can have twins, and it can be right or left handed? Come and learn more about this interesting mineral.



Mineral of the Month – Quartz

Left: Quartz, Fat Jack mine, Yavapai County, Arizona, l Sussman collection, Jeff Scovil photograph

Center: Quartz, Japan law twin, Holland mine, Washington Camp, Santa Cruz County, Arizona, Flagg Mineral Foundation Collection, Jeff Scovil photograph

Right: Quartz after chrysocolla, after malachite, after azurite, Live Oak mine, Miami, Gila County, Arizona, Les and Paula Presmyk collection, Jeff Scovil photograph.

Sun City Rockhound Mineral Museum
Sundial Recreation Center
14801 N. 103rd Ave.
Sun City, AZ 85351
scrockmuseum@gmail.com
623-428-6442

C. Sandoval photo

Winter Hours
October – April
10 am to 1 pm
Closed Thurs., & Sunday
Summer Hours
May-September 10am-1pm
Saturdays only

The museum does offer private party tours. Clubs and private individuals interested can contact the museum at scrockmuseum@gmail.com.

Keep cool, book a tour and enjoy the beautiful minerals on display from the UA Mining, Mineral & Natural Resources Education Museum.

Azurite & Malachite, New Cornelia Mine, Ajo, Pima Co., AZ
Donor: Phelps Dodge Corp.

Fluorite, Homestake Mine, Oatman, Mohave Co., AZ
AZMMNRE Museum specimen

Chrysocolla, Tyrone Mine, Tyrone, Grant Co., NM
Donor: Dennis Bartlett

Arizona Rock and Gem Shows

Apache Junction Rock & Gem Club
Meetings are on the 2nd Thursday
Next Meeting: September 12, 2024, 6:30 pm
www.ajrockclub.com
@ Club Lapidary Shop
2151 W. Superstition Blvd., Apache Jct.

Daisy Mountain Rock & Mineral Club
Meetings are on the 1st Tuesday
(unless a Holiday then 2nd Tuesday)
Next Meeting: September 3, 2024, 6:30 p.m.
Please go to their website for more info
www.dmrmc.com
@ Anthem Civic Building
3701 W. Anthem Way, Anthem, AZ

Maricopa Lapidary Society, Inc
Note: New meeting day
Meetings are on the 3rd Tuesday
Next Meeting: September 17, 2024, 7:00 pm
www.maricopalapidarysociety.com
@ North Mountain Visitor Center
12950 N. 7th St., Phoenix, AZ

Mineralogical Society of Arizona
Meetings are on the 3rd Thursday
(Except December & June)
Thursday, September 19, 2024, 7:30 p.m.
Franciscan Renewal Center, (Piper Hall),
5802 E. Lincoln Drive, Scottsdale, AZ
www.msaaz.org

Pinal Geology & Mineral Society
Meetings are on the 3rd Wednesday
Next Meeting: September 18, 2024, 7:00 pm
In person meeting
www.pinalgeologymuseum.org
351 N. Arizona Blvd., Coolidge

West Valley Rock & Mineral Club
Meetings are on the 2nd Tuesday
Next Meeting: September 10, 2024, 6:30 pm
www.westvalleyrockandmineralclub.com
Buckeye Community Veterans Service Center
402 E. Narramore Avenue, Buckeye, AZ

Gila County Gem & Mineral Society
Meetings are on the 1st Thursday
(unless a Holiday then the next Thursday)
Next Meeting: September 5, 2024, 6:30 pm
www.gilagem.org
Club Building
413 Live Oak St, Miami, AZ

Wickenburg Gem & Mineral Society
Meetings are on the 2nd Friday
(February & December on the 1st Friday)
Next Meeting: September 13, 2024, 7:00 pm
www.wickenburggms.org
@ Coffinger Park Banquet Room
175 E. Swilling St., Wickenburg

ESM's Meeting Notice

ESM's next meeting will be at North Mountain Visitor Center, 12950 N. 7th St., Phoenix, on Tuesday, TBA 2024, at 6:30 p.m.

BECOME A MEMBER!

Join the Earth Science Museum's

esi: Earth Science Investigation team

IS IT TIME TO RENEW YOUR MEMBERSHIP?
Please renew today! ☺☺☺

_ _ _ _ _ _ _ _ cut here _ _ _ _ _ _ _ _ _

ESM Earth Science Investigation Team Membership Form

_____ New Member _____ Renewal

Membership levels:

_____ ESI Family $20

_____ ESI Individual $10

Membership benefits:

- Monthly e-newsletter *Earthquake*
- Official team membership card
- Knowledge that your contribution is making a difference in earth science education.

MANY THANKS TO OUR MAJOR DONORS!

AZ Leaverite Rock & Gem Society

Flagg Mineral Foundation
www.flaggmineralfoundation.org

Friends of the AZ Mining & Mineral Museum

Maricopa Lapidary Society
http://maricopalapidarysociety.com/

Mineralogical Society of AZ
www.msaaz.org

Payson Rimstones Rock Club
https://www.rimstonesrockclub.org/

Sossaman Middle School

White Mountain Gem & Mineral Club
www.whitemountain-azrockclub.org

Sun City Rockhound Club & Mineral Museum
https://suncityaz.org/recreation/clubs/rockhound-club-mineral-museums/

Wickenburg Gem & Mineral Society
http://www.wickenburggms.org
www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438

West Valley Rock and Mineral Club
http://www.westvalleyrockandmineralclub.com/

Staples Foundation
www.staplesfoundation.org

Anita Aiston	Will & Carol McDonald
Peter & Judy Ambelang	Debbie Michalowski
Stan & Susan Celestian	Janet Stoeppelmann
Russ Hart	Dennis & Georgia Zeutenhorst

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We're on the Web!

Visit us at:

www.earthsciencemuseum.org

Mission
Our Mission is to excite and inspire all generations about earth sciences through educational outreach.

Vision
We envision a community where students and the general public have curiosity about, passion for, and understanding of the underlying principles of earth sciences.

For more information about the ESM, how to become a member or how to arrange for a school visit or Community function, go to: www.earthsciencemuseum.org.

NOTICE:
ESM's next meeting will be at North Mountain Visitor Center, 12950 N 7th St, Phoenix, on Tuesday, TBA 2024, at 6:30 p.m.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

Earth Science Museum
3215 W. Bethany Home Rd.
Phoenix, AZ 85017